

MISSOURI CONSERVATIONIST

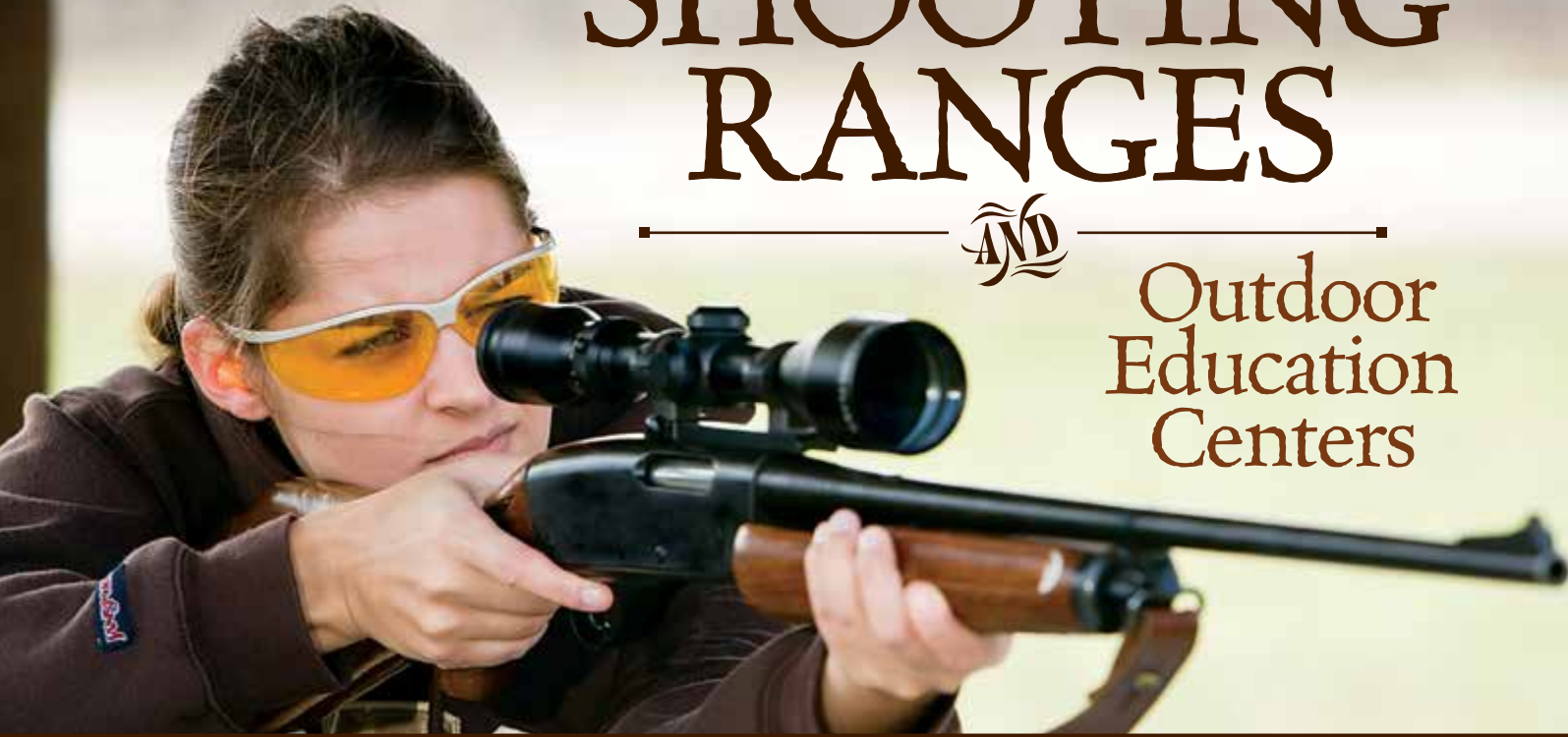
VOLUME 78, ISSUE 9, SEPTEMBER 2017
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MISSOURI DEPARTMENT OF CONSERVATION



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White-tailed
deer

MISSOURI CONSERVATIONIST



ON THE COVER

A monarch butterfly feeds on nectar from a New England aster.

NOPPADOL PAOTHONG

100-400mm lens, f/5.6
1/500 sec, ISO 400

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Letters to the Editor

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REDESIGN PRAISE

I love the new format of the *Missouri Conservationist*! This is the best it has been in my 54 years. Please keep this same format. It is very colorful, readable, informative. I love it!

Amber Redburn
West Plains

MORE REDESIGN FEEDBACK

Your tweaks to the *Missouri Conservationist* jump off the page like the face of a blushing bride. Bravo!

Van Reidhead Augusta

When I opened the July issue, I was both shocked and disappointed. Photographs and graphics should complement the content. This new format is just the opposite – limited and redundant. I am sad to see a long history of educational excellence come to an end.

Jim Coffey Galena

I was overjoyed to find one of our wonderful Missouri creatures on the back cover [July]. I love being able to identify our wonderful wildlife. I am so proud of our state's Conservation Department. I "sell" the magazine to anyone who will listen, and I even send it to my out-of-state son.

Penny Odell St. Louis

The new format is very clear, clean, and easy to read, but please bring back the single panel cartoon. I always enjoyed looking for it!

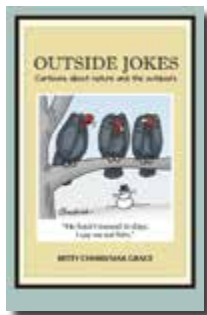
Gary Shannon Chesterfield

I enjoyed the new layout of the magazine, but where was the cartoon?

Shirley Mounts Maryville

We ran the final cartoon in the June 2017 issue, but you can still purchase *Outside Jokes*, a collection of more than 200 nature cartoons by Betty Chmielniak Grace, for \$8.75 plus tax and shipping. Call toll-free 1-877-521-8632, or order online at mdcnatureshop.com.

—THE EDITORS



NATURAL AREAS

Celebrating Missouri's Natural Legacy by Mike Leahy [Page 10, July] not only provided interesting information about our state and its essential natural areas, but it also gave key talking points in communicating the value of native plants and how they provide the foundation of life. An example was given regarding the diet of turkey poults and how it consists mostly of insects. More of these insects live in habitats abundant with native plants. This may explain why I haven't seen many grasshoppers yet, thanks to the resident flock of turkeys making themselves at home in my 10-acre valley covered with native vegetation.

Christine Torlina Cedar Hill

OUTDOOR ACCESSIBILITY FOR ALL

We were recently in Rich Hill, and our relatives there always give us copies of the *Missouri Conservationist*. I find them very informative. Your May 2017 edition was especially gratifying because of your article on individuals with disabilities being able to enjoy the outdoors with adaptive equipment [Page 22, *Ready, Willing, and Empowered*]. We have a son with disabilities, and we know the importance of specialized equipment. Thank you for this wonderful article.

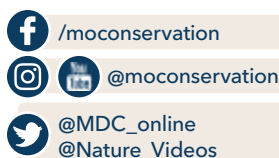
Tim and Martha Brooks Newark, Delaware

MILKWEED FOR MILITARY

In July's issue, the picture of milkweed [Page 18] and the article on Isaac Breuer [Page 8, *I Am Conservation*] reminded me of a project the students at Enterprise School participated in around 1943. There were about 12 students in first through eighth grades, and we were asked to pick milkweed pods just before they would ripen and burst. We were told sailors and soldiers used the seeds in life jackets. Since everyone knew someone in the military at that time, we gladly hit the fields and brought back milkweed pods in buckets and sacks of all descriptions.

Gil Head Kearney

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Send a note using our online contact form at mdc.mo.gov/commissioners.



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Share your photos on Flickr at
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or include the hashtag #mdcdiscovernature
on your Instagram photos.



1

1 | Broad-headed
skink by **Shanna
Martin**, via email

2 | Blazing star
by **jib_jab22**,
via Instagram

3 | Common
grackle by **Kevin
Wilson**, via Flickr



2



3

MISSOURI CONSERVATION COMMISSIONERS



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Nicole
Wood



Up Front

with Sara Parker Pauley

✱ **Dave Hall is one of those extraordinary, “larger than life” people** who typically make an impact in the world. Dave served as a special agent in charge for the U.S. Fish and Wildlife Service (USFWS) in his home state of Louisiana, and I met him after his undercover work investigating international poachers was featured in the book *Game Wars*. Dave, with his Cajun blood and tall stature, was a daunting presence indeed.

Dave taught me several important lessons about conservation law enforcement that I have never forgotten, including the importance of using every opportunity to promote wildlife management to the public. He never gave up on trying to reach people, even those he arrested. He also taught me robust law enforcement is as important to successful wildlife management as strong, science-driven regulation.

Undercover work such as Dave’s is a time-honored law enforcement technique. In recent years, we’ve added the use of DNA evidence to the investigative tool box, and our conservation agents often use DNA evidence to solve violations of the *Wildlife Code of Missouri*. Learn more about their investigative efforts in *CSI: Conservation — Missouri conservation agents use DNA evidence to solve wildlife crimes* on Page 22.

While we’re grateful for our conservation agents (and USFWS special agents) for their passionate approach to conservation protection, we can all share the worthy message of conservation. You don’t have to be larger than life to make a real and lasting difference.

Sara Parker Pauley

SARA PARKER PAULEY, DIRECTOR
SARA.PAULEY@MDC.MO.GOV

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Printed with soy ink



mdc.mo.gov 3

Nature LAB

by Eleanor C. Hasenbeck

Each month, we highlight research MDC uses to improve fish, forest, and wildlife management.

WATERFOWL MANAGEMENT

Tracking Mallard Migration

✳ As the first mallards arrive at Grand Pass Conservation Area in late September, Chris Freeman counts them. A few green heads stick out from the flocks of teal, pintails, and gadwall. This is a zero.

In a few weeks' time, the mallards will catch an arctic front, and more than 100,000 will find their way to feed at Grand Pass. This is a 10 — peak migration.

Freeman, an MDC wildlife management biologist, is part of an international network of waterfowl managers and researchers ranking the mallard migration. As the birds travel south from their summer breeding grounds, managers report a weekly ranking between 0-10, which measures what stage of the migration the area is in. MDC mapping specialists piece these data points together to create a heat map of the migration, much like a weatherperson creating a temperature map using data from different weather stations.

"To me, tracking migration is one of the unique ways to enjoy nature," said MDC Waterfowl Biologist Andy Raedeke. "Just knowing that you're witnessing



Mapping migration is useful for managing habitat and helping birders and hunters plan outings along the fall migration route

that movement as it happens, and across state, even national lines — that's really exciting."

The information is useful to both hunters and managers. If Freeman knows thousands of ducks are bedding down in parts of South Dakota or Iowa, he also knows the next northerly wind will likely bring thousands of hungry mallards to his area, and he can manage the habitat to make more food accessible. Over the long-term, tracking annual migrations can help researchers notice and understand changes in the pattern and timing of migration.



Monitoring Mallards

Every week from late September to early February, more than 100 experts rank the progress of mallards counted in their areas.

2

Countries involved in data collection: Canada and the United States



North American data-collection locations

170



Peak number of mallards counted in Missouri during the 2016 fall migration:

991,796

To view the mallard migration app, visit short.mdc.mo.gov/ZiR

In Brief

News and updates from MDC



Niawatha Prairie
Natural Area

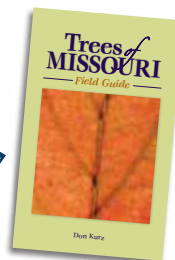
GET INFORMATION, GIVE FEEDBACK AT MDC OPEN HOUSES

NO REGISTRATION IS REQUIRED. REFRESHMENTS WILL BE SERVED. THE FIRST 80 ATTENDEES AT EACH OPEN HOUSE WILL RECEIVE A SPECIAL GIFT.

➔ MDC is celebrating 80 years of serving nature and you at open houses around the state. Come learn about MDC's history, priorities, and challenges, and share your thoughts about regulations, infrastructure, strategic priorities, and statewide and local conservation issues.

Join Director Sara Parker Pauley and local community leaders from 6–8 p.m. at these upcoming open houses:

- **Sept. 7** at the Powder Valley Conservation Nature Center, 11715 Cragwood Road in Kirkwood
- **Sept. 26** at Kemper Recital Hall in Spratt Hall 101 on the Missouri Western State University campus, 4525 Downs Drive in St. Joseph
- **Oct. 10** at the Springfield Conservation Nature Center, 4601 S. Nature Center Way in Springfield
- **Oct. 12** at Twin Pines Conservation Education Center, 20086 Highway 60 in Winona
- **Oct. 26** at the Anita B. Gorman Conservation Discovery Center, 4750 Troost Ave. in Kansas City



We also will be gathering public comments at these upcoming events:

- **Sept. 9–16** at the SEMO District Fair in Cape Girardeau
- **Sept. 21–23** at “Hootin and Hollarin” in Gainesville
- **Sept. 23** at National Hunting and Fishing Day in Hannibal
- **Sept. 30** at the South Farm Showcase in Columbia
- **Oct. 15** at our Poosey Fall Driving Tour in northwest Livingston County

For more information, contact Michele Baumer, public involvement coordinator, at 573-522-4115, ext. 3350 or Michele.Baumer@mdc.mo.gov.

CONSERVATION COMMISSION WELCOMES NEW COMMISSIONER NICOLE WOOD

Gov. Eric R. Greitens appointed Nicole Wood, long-time conservationist and outdoor enthusiast from St. Francois County, to the Missouri Conservation Commission. Wood replaces James T. Blair IV, of St. Louis, whose appointment expired. Wood's appointment will be subject to confirmation by the Missouri Senate.

Wood is the director of operations at Woodland Operations and Maintenance, where she is involved in the daily management of 20,000 acres of land in the Missouri Ozarks. She is only the fifth woman appointed to the Conservation Commission in the department's 80-year history.

"Nicole's passion for the outdoors and her strong business acumen will be extremely beneficial to the Commission's ongoing work in strategic planning, budget guidance, and *Wildlife Code* regulations," said Missouri Department of Conservation Director Sara Parker Pauley.

Wood serves on the boards of the National Wildlife Federation, Conservation Federation of Missouri, Parkland Hospital Foundation, and the National Wildlife Federation Endowment. She and her family share a passion for the outdoors.

"Missouri has the best Department of Conservation in the United States and to be part of that as a commissioner is an incredible honor," Wood said. "I look forward to working with all the commissioners, staff, and citizens on continuing to make the department the best in the country."

Her interest in the outdoors started at a young age while on family hunting and fishing trips. She enjoys floating, rafting, kayaking, or just sitting on a gravel bar. Wood shares a family history of commitment to conservation with

her father, Howard Wood, who served as commissioner from 1997 to 2003.

Nicole Wood's term will expire June 30, 2023.



Turkey hunting is just one of many outdoor activities Commissioner Wood enjoys.



Got a Question for Ask MDC?

Send it to AskMDC@mdc.mo.gov
or call 573-522-4115, ext. 3848.

Q: Every time I harvest a turkey, I open its gullet to see what it's been eating. Over the years I've found salamanders, snails, beggar's lice, and katydids. Last year, I bagged a gobbler on opening day. His gullet contained these giant seeds. What are they?

➔ This appears to be a pawpaw (*Asimina triloba*) seed, according to our Forestry Division.

Pawpaws are Missouri's answer to the banana. The trees yield soft fruits about 3 to 5 inches in size, with skin that resembles a pear's in texture and appearance. Green at first, the yellowish fruits ripen in September and are easy to gather from the ground. The taste is sometimes described as a cross between a persimmon and an overripe banana.

Humans aren't the only animals that covet them. Squirrels, opossums, raccoons, and birds also appreciate pawpaws.

The trees – short with slender trunks, broad crowns, and wide leaves – grow in colonies. These shade-lovers prefer low bottom woods,



Pawpaw seed

wooded slopes, stream banks, ravines, and the areas below bluffs. Pawpaws are members of a tropical family and have no close relatives in Missouri.

Q: How can I discourage snakes from coming too close to my home?

➔ Although snakes are a part of Missouri's outdoors, there are times and places where their presence is unwanted. Venomous snakes are not desirable around human dwellings. It is possible to discourage snakes around homes by eliminating their food and shelter. Piles of boards, fence posts, dump heaps, roofing paper, scrap steel roofing, railroad ties, slabs of bark, and piles of rocks provide hiding places for snakes and the prey they eat. Removing these attractions and generally tidying up are the best ways to keep a premise free of snakes.

There are no reliable perimeter sprays or chemicals to repel snakes.

Missouri residents often welcome or tolerate nonvenomous snakes. However, if you are afraid of or worried about snakes, we recommend you capture any harmless snake you encounter with a hoe or stick or sweep it into a large container and release it unharmed in an isolated, safe habitat.



Q: Can you ID this "fly/wasp" for me?

➔ This beautiful specimen is actually a fly in the family Syrphidae, which includes many bee- and wasp-mimicking species. Although fierce-looking, it's actually just a fly and lacks the anatomy to sting.

It's not unusual for syrphid flies to exhibit forms of "Batesian mimicry," a term that describes when a harmless species has evolved to imitate the warning signals of a harmful species. This form of mimicry is named for the English naturalist Henry

Walter Bates, who studied it in butterflies. It allows the mimic to intimidate potential predators with the threat of a toxic taste or painful sting without having to actually develop the defensive trait. Syrphid flies are often seen hovering near flowers. Although adults mainly feed on nectar and pollen, syrphid larvae prey on aphids, thrips, and other plant-sucking insects that cause tens of millions of dollars of damage to crops worldwide.

AGENT ADVICE

from

Jerry Kiger

OZARK COUNTY
CONSERVATION AGENT

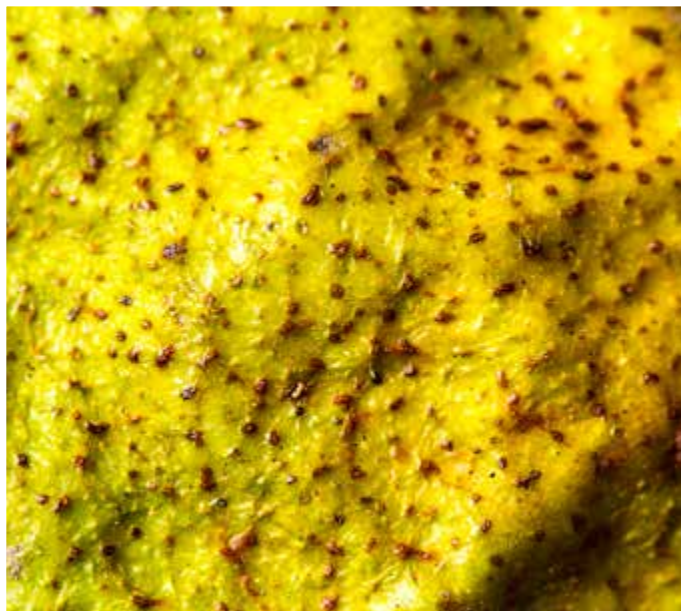
One-third of the state is under a concentrated-feeding ban to help prevent the spread of chronic wasting disease (CWD) among our deer population. In 41 counties, known as the CWD Management Zone, residents are prohibited from using grain, corn, sweet feed, mineral or salt blocks, or any other natural or manufactured consumable products to attract deer. The ban doesn't include scents, such as doe scent or doe urine, and food plots. With food plots, deer move through the area, browsing as they eat, as opposed to concentrated feed sites, where deer gather in one spot and have a higher potential for transmitting infected saliva. We know we have CWD in our state. Efforts like this will help slow the spread of the disease. Please do your part.



What IS it?

Can you guess this month's natural wonder?

The answer is on Page 9.



I AM CONSERVATION

Mary Harter

Mary Harter teaches 6th-grade life sciences at Woodridge Middle School in High Ridge.

➔ Harter likes to get kids thinking about careers in science, technology, engineering, and math. "I want them to understand how important science is. How it can help us deal with pollution and reduce our carbon footprint."

She reveals the connections

Harter uses MDC's Discover Nature Schools program to help her students explore life sciences through Missouri's aquatic resources. They survey local pond life and test water quality. "Students are surprised to learn that storm water doesn't go into the sewer – it goes into local streams and into our drinking water system," she said. "It makes kids connect what's going on in class to real life."

In her own words

"If you're a teacher, take advantage of all the resources MDC has to offer. They have week-long courses and day courses in your area. These resources help make what we do more fun."



by Noppadol Paothong



WEBCAST: MOUNTAIN LIONS IN MISSOURI

Mystery, intrigue, and misinformation surround mountain lions in the Show-Me State. Separate fact from fiction at our upcoming Wild Webcast: Mountain Lions in Missouri Sept. 20 from noon to 1 p.m.

MDC Furbearer Biologist Laura Conlee and Wildlife Management Coordinator Alan Leary of Missouri's Mountain Lion Response Team will provide a brief presentation on these big cats and answer questions from webcast participants.

To register, visit short.mdc.mo.gov/ZiF.

HIT THE WOODS FOR YOUR HEALTH

Cooler weather and the kaleidoscope of fall colors make September the perfect time to visit Missouri's wooded areas. But don't just power hike – slow down. Open your senses to the wonders of the woods. See. Hear. Smell. Taste. Touch.

Not only will you discover nature in new ways, it's good for you. Research shows walking in the woods can help reduce stress and improve immunity. As you relax, blood pressure drops and mood improves.

One research study compared the health effects of walking city streets to walking in the woods. While both activities required the same amount of physical activity, walking in the woods resulted in greater reductions in blood pressure and stress hormones.

Researchers are also studying trees' stress-reducing compounds, such as the scent of cedar. Inhaling these compounds has been shown to reduce concentrations of stress hormones and increase the activity of white blood cells, which are important for fighting illness.

Find a wooded area near you at short.mdc.mo.gov/Z4V.

What IS it?

BLACK WALNUT

The fruit of a black walnut (*Juglans nigra*) – the dark brown or black nut – ripens from September through October and is covered by a green, rounded husk 1½–2½ inches across. Missouri is the world's top producer of black walnuts, and it's designated as the state's official tree nut.

Photograph by David Stonner





The *Butterfly* Effect

TINY CHANGES CAN LEAD
TO BIG CONSEQUENCES FOR
MONARCH CONSERVATION

by Matt Seek

SEPT. 20, 2007
Columbia, Missouri
39 N Latitude

This is the moment when I first hear a butterfly's wings: We are standing in a goldenrod meadow, my 4-year-old daughter and I, but it feels as though we're inside a snow globe. A blizzard of orange-and-black butterflies swirls around us — hundreds of monarchs, the most I've ever seen in one place. But Maya pays no attention. Her eyes are locked on the creature folded origami-like between her thumb and forefinger. She turns her hand this way and that, examining the quivering antennae, the bristly legs, the delicate proboscis curled into a spiral. Then, after glancing up to make sure I won't miss the magic that's about to





Tiny, weatherproof
stickers help biologists
track migrating
monarchs.

PHOTOGRAPH BY
MATT SEEK

unfold, she extends her pudgy arm, and opens her fingers. As the butterfly flutters skyward, a tinkling giggle escapes Maya's mouth. And from that moment forth, whenever I see a monarch fluttering in the breeze, my daughter's laughter is the sound that I hear.

A few days earlier, several dozen tiny round stickers had arrived in our mailbox. They were butterfly tags from Monarch Watch, a conservation, education, and research nonprofit based out of the University of Kansas. We were to affix a sticker to the hind wing of any monarch we caught. If one of our butterflies wound up in the hands of someone else, a code printed on the sticker would match the monarch to where we had tagged it.

The butterfly Maya had just released was wearing such a sticker. JNE152 was a large, newly emerged female. We don't know where she went immediately after leaving Maya's hand. But we do know where, three months later, she ended up: Mexico.

Migration Mystery

Danaus plexippus is North America's most far-flung butterfly. Every fall, monarchs east of the Rockies migrate up to 3,000 miles south to reach their wintering grounds in the mountains of central Mexico. In Missouri, migration reaches



full flutter in mid-September, when cool weather, dying milkweed, and changing day lengths trigger the itch to wander.

Why do monarchs migrate? If you were to chart their family tree, you'd find it's made entirely of tropical and subtropical ancestors. None of the family members — including monarchs themselves — are equipped to survive temperate-zone winters. But milkweeds, the plants most essential to a monarch's life cycle, grow all the way into Canada. To take advantage of this

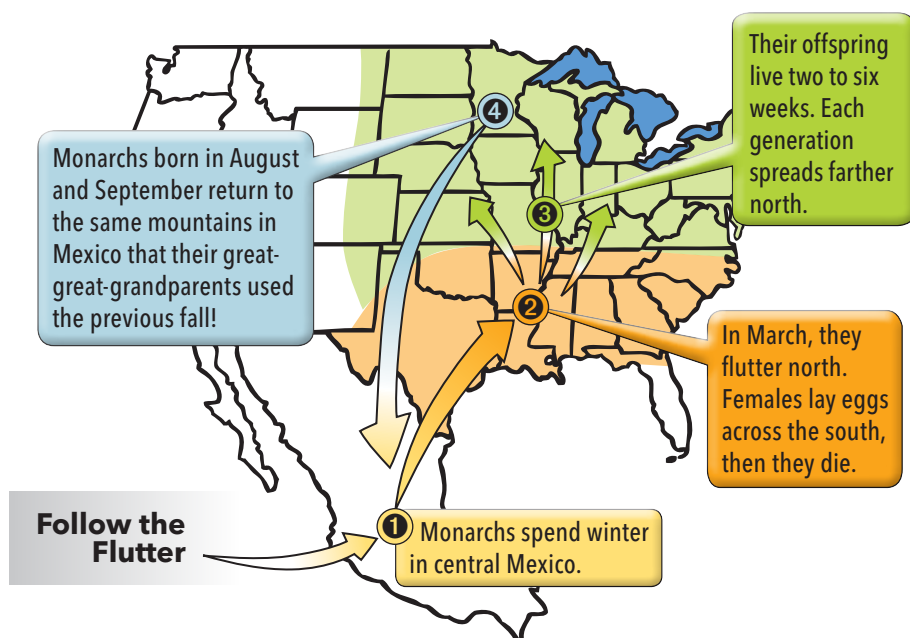
resource, monarchs evolved the ability to follow sprouting milkweeds north in the spring and then hightail it south in the fall.

JNE152 was born in late August. This made her different in several important ways from monarchs born in spring and summer. For one thing, she had emerged from her chrysalis in a state known as reproductive diapause. This simply meant that her urge to mate was temporarily turned off. For another, if her luck held, JNE152 might live up to nine months. A summer monarch would do well to persist past five weeks. And finally, a change in one of JNE152's genes made her flight muscles more efficient. Essentially, summer monarchs were sprinters. Fall monarchs were marathoners.

Exodus

OCT. 3, 2007
Okmulgee, Oklahoma
35° N Latitude

JNE152 had sailed out of Missouri and was now fluttering through the Sooner State. On average, she moved about 30 miles daily, but with clear skies and a strong tailwind, she was capable of cruising at 15 mph and putting more





Nectar fuels the flutter. During migration, a monarch's weight may increase by nearly 50 percent.

The biggest threat to the monarch population is the disappearance of milkweed.



Common milkweed

than 100 miles behind her. Like most migrating monarchs, she spent about 10 hours aloft each day, touching down periodically to refuel on nectar.

A monarch's glide ratio is such that every 4 feet of forward progress is accompanied by a drop of 1 foot in altitude. To conserve energy, monarchs ride updrafts, and pilots routinely spot them flying above 10,000 feet. On peak migration days, it's likely thousands of monarchs glide by overhead without notice.

Storms often blow migrants hundreds of miles off course. Droughts wilt nectar sources. Highways present a gauntlet for low-flyers. And the threat of frost is ever present. Though scads of animals eat monarchs, predation is mitigated by the diet of the larvae.

Milkweed, the only plant a monarch caterpillar will eat, brews in its cells a chemical concoction of toxins known as cardenolides. Nibble a little milkweed, and you'll vomit violently. Eat a bunch of milkweed, and your heart will stop.

Monarch larvae store cardenolides in their body tissues. The toxins remain after metamorphosis, making adult monarchs poisonous even though they no longer feed on milkweed leaves. The striking orange-and-black pattern on a monarch's wings is a warning: This bite-sized butterfly is deadly to eat.

South by Southwest

OCT. 24, 2007
Asherton, Texas
28 N Latitude

In the Hill Country of southwest Texas, JNE152 slowed her pace and devoted more time to sipping nectar. Migrating monarchs actually get fatter as they fly south. Nectar becomes scarce during winter, so migrants must ration their fat to survive until spring.

To find her way, JNE152 used a sun compass in her brain and a clock in her antennae. If her clock read 8 a.m., she flew to the west of the sun. At noon, she flew straight toward the sun. And at 5 p.m., she kept the sun off her starboard wing. In this way, migrating monarchs are able to maintain a more-or-less south by southwest bearing.

Landscape features also offer navigational clues. The Gulf of Mexico turns migrants west toward southern Texas. From there, two mountain ranges — the Sierra Madre Orientals and the Sierra Madre Occidentals — funnel migrants down the spine of Mexico to a relatively small region northwest of Mexico City.

Milkweeds vary in toxicity. Because of this, some monarchs are more poisonous than others.



Monarch caterpillar

Sanctuary of Wayward Souls



© CHARLES SHAPIRO | DREAMSTIME.COM

Overwintering in Mexico

NOV. 1, 2007
El Rosario, Mexico
19.5 N Latitude

If she kept pace with her fellow migrants, JNE152 probably fluttered through the sleepy village of El Rosario during Day of the Dead, a time when Mexicans honor their dearly departed. The monarchs' arrival is so punctual that people of the region associate the cascades of orange-and-black butterflies with souls of their loved ones returning from the afterlife.

By mid-November, JNE152 sought sanctuary in the oyamel fir forests in the mountains above El Rosario. There, at an elevation of about 11,000 feet, monarchs huddle together on trees in clusters so dense that they sometimes break branches. Most clusters form 20 to 50 feet above the ground. This is the Goldilocks zone, where temperatures stay cold enough to slow a monarch's metabolism but not so cold that a monarch freezes to death.

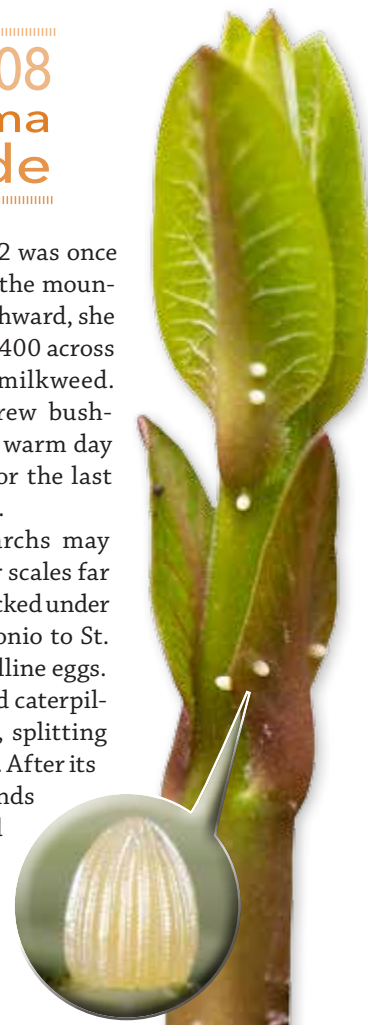
Although locals had known about the overwintering colonies for centuries, their exact location had remained a secret to science until late in the 20th century. Dr. Fred Urquhart of the University of Toronto began tagging monarchs in the 1930s. Decades of data led him to believe that the monarch stronghold must be somewhere west of Mexico City. He hired Ken Brugger, an engineer working in Mexico, to search for the sites. Locals led Ken to the colonies in January 1975. It was the entomological equivalent of discovering $E=MC^2$.

Relay for Life

MARCH 15, 2008
Tulsa, Oklahoma
36 N Latitude

By the end of February, JNE152 was once again on the move. As she left the mountains of Mexico and forged northward, she laid eggs, scattering more than 400 across nearly a thousand miles of milkweed. Eventually, her pale wings grew bush-ripped and bird-torn. And on a warm day in March, she touched down for the last time somewhere south of Tulsa.

Though a handful of monarchs may return home, most scatter their scales far short of their birthplaces. But tucked under milkweed leaves from San Antonio to St. Augustine are billions of crystalline eggs. Out of these hatch comma-sized caterpillars. Each gorges on milkweed, splitting its skin five times in the process. After its fifth molt, the caterpillar suspends itself under a sturdy leaf and curls into a "J." When its skin splits a final time, a jade-green chrysalis is revealed. The adults that emerge, 10 to 14 days later, flutter northward. They mate and lay eggs as they go, until North America once again brims with butterflies.



On average, a female monarch lays about 400 eggs. Only a few survive to adulthood.

Temperature plays a role in how long it takes for an egg to become an adult. Although it typically takes 30-35 days, it can be as short as 25 days or as long as 50 days.



Larva

The first thing a larva eats is the eggshell it hatched from. After that, it subsists on a strict diet of milkweed.



Despair

AUG. 1, 2017
Columbia, Missouri
39 N Latitude

In the decade since JNE152's journey, my daughter has grown bigger, and monarch numbers have grown smaller. Eastern populations are measured by the area they occupy at overwintering sites in Mexico. In 1996, overwintering butterflies covered nearly 21 hectares. In 2014, they covered less than one. Biologists estimate that monarch numbers have shrunk by nearly a billion butterflies since 1990. The population is now so small that a single disaster in Mexico — a winter storm, for example — could wipe it out.

What has caused the declines? Illegal logging of overwintering habitat is partially to blame. Climate change, and the unpredictable weather it may spawn, also concerns scientists. But the biggest threat is the disappearance of milkweed due to land development and the widespread use of herbicides.

Monarch Watch calculates that nearly 2.2 million acres of milkweed vanishes from the U.S. each year. By conservative estimates, roughly 200,000 square miles of habitat has been lost since 1996. Unless things change, the outlook for migrating monarchs looks grim.

Rapid Growth

Larvae grow at an incredible clip. In only 15 days, a larva may be 3,000 times heavier than its weight at hatching.



Shedding

When a caterpillar has grown too large for its own skin, the skin splits and sloughs off.



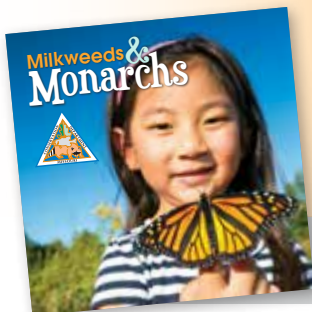
NOPPADOL PAOTHONG



Save the Monarchs

Rescuing one of nature's most miraculous migrations will require more than hope. Fortunately, people across the country – from school kids, to homeowners, to farmers – are pitching in to save this iconic insect. If you want to get involved, here are a few helpful resources.

- The Monarch Joint Venture acts as a clearinghouse for nationwide monarch conservation efforts and information. Visit them at monarchjointventure.org.
- The U.S. Fish and Wildlife Service offers monarch conservation tips for homeowners, landowners, and communities at fws.gov/savethemonarch.
- If you want to tag monarchs, Monarch Watch is the place to go. Their website also provides top-notch information on monarch biology, migration, and conservation. Check it out at monarchwatch.org.
- To report monarch sightings and follow spring and fall migrations, visit Journey North at learner.org/jnorth/monarch.
- For landscape plans and a list of recommended plants to create backyard monarch habitat, visit mdc.mo.gov/monarch.
- Local sources for monarch-friendly plants can be found at grownative.org.
- Missourians for Monarchs seeks to connect Show-Me State residents who are working to create and protect monarch habitat. Check them out at facebook.com/MissouriansForMonarchs.



Maya, now age 14, prepares to release another tagged monarch.

Hope

Letting go of a tagged monarch is an exercise in hope. You hope, despite the odds, that the plucky little creature will survive its perilous journey. You hope its offspring will return the following spring. You hope your daughter will have the chance to watch her own child release a monarch someday. You hope that she, too, might hear the sound of a butterfly's wings.

In the 1960s, a meteorologist working at MIT discovered something profound about how nature works. He was running a computer program that simulated weather patterns, and he had just made a tiny, seemingly inconsequential change to one of the variables. When he ran the program again, what was once drizzle in New England had morphed into a

tornado over the Midwest. The pattern became known as the “butterfly effect” because it suggested that the flapping of a butterfly's wings could change the course of a hurricane. In other words, tiny changes can lead to big consequences.

Can the same idea apply to monarchs? Can small actions change their fate? That's what thousands of monarch enthusiasts are banking on. Across the U.S., Canada, and Mexico, volunteers are planting milkweed, helping scientists track monarchs, and educating others about this iconic insect.

I hope you'll join the effort. ▲

Matt Seek is the editor of Xplor, MDC's magazine for kids. He hopes to tag at least 50 monarchs this fall with his daughter and son.

Milkweeds & Monarchs outlines tips for creating monarch habitat. Get a free copy of this booklet by calling 573-522-0108.





Suburban Whitetails

WHERE SMALL PROPERTIES PROVIDE
OPPORTUNITIES FOR ARCHERY HUNTERS

by Tim Kjellesvik

Deer understand the advantages of life in suburbia. As a bowhunter, learn how you can take advantage of it, too.

PHOTOGRAPH BY
NOPPADOL PAOTHONG

The soundtrack for the afternoon's deer hunt included squirrels cutting walnuts, a chilly southbound breeze rustling a few dried leaves still clinging to tree branches, and the shouts and cheers from a nearby soccer game.

For the suburban bowhunter, we might be living in the glory days of white-tailed deer hunting. While whitetail numbers across Missouri are a mixed bag, in some suburban municipalities, deer numbers are high and, in some cases, have reached nuisance levels. With suburban populations booming, exasperated property owners struggle to maintain landscape vegetation or gardens. This overabundance creates a great opportunity for deer hunters to put some venison in the freezer and maybe even a trophy on the wall.

A Win-Win Scenario

Most deer hunters do not own their own land, and it's not always realistic to get access to a 500-acre farm. Suburban bowhunting is a great alternative because it sits at the sweet spot of convergent needs. Local landowners want their yards back, and bowhunters want a nearby property with a high potential for harvesting deer. By their very nature, these locations are typically closer to home and are perfect for a quick sit in the evening after work. You don't have to plan a multiday expedition just to go deer hunting.

Misconceptions About City Deer

You may have some reservations about deer hunting in suburbia. You may think it's too easy to shoot a deer that's used to being around people. Or being on a small property in a neighborhood, rather than a sprawling forest, limits your opportunities. Let me share a few thoughts and experiences that may change your mind.

Suburban deer are no slouches. I've been winded and had my position blown enough to know this. You might think the deer have grown accustomed to human scent, but their noses are so sophisticated that they not only can detect scent, but they also can sense the strength of the scent. They can judge if someone has walked through a trail hours before or if someone is coming right now. While it's true some deer have learned that a

person walking down a sidewalk with a stroller isn't much of a threat, a scent trail emanating from an unseen person — a camouflaged-clad hunter in a tree, for instance — will send them huffing and running. All the same scent control and visual concealment rules apply if you're miles deep into Peck Ranch Conservation Area or 50 yards downhill from a backyard swing set in Wildwood.

Property size is a human perspective to which deer pay no mind. Deer don't care who owns the hillside of white oaks that always produce a great mast of acorns. They don't know that you have permission from the nice older couple you met at the store to hunt a low spot on their fence line between a meadow of grass and a stand of cedars. If you can start thinking like a deer and see properties less for their lack of size and more for what they would offer an animal, you'll increase your odds of getting close enough for a great shot.

Does aren't the only deer congregating near human dwellings. I've seen a number of blurry buck pictures that were obscured only because they were taken through a kitchen window. What better place to hide out than right under our noses?

Admittedly, hearing someone fire up their lawnmower during a hunt is not my ideal scenario, but for the density of deer in some of these places, I'll put up with the occasional lawn maintenance.

Mind the Regulations

There are significant differences to keep in mind while bowhunting in suburbia. Foremost are the various regulations municipalities put on hunting activities that sometimes go beyond what the Missouri Department of Conservation requires. Some cities require hunters to carry written permission from the landowner while afield. Some place distance requirements on how far away you have to be from structures and homes. Checking with the city's website for regulations is your best bet. To be safe, since not everyone is familiar with these intricacies, it's a good idea to print out a copy of the ordinances so you can gently and respectfully inform anyone with questions about the legality of your pursuit.



MDC works closely with city leaders in drafting ordinances to allow use of hunting equipment within city limits. For more information, visit short.mdc.mo.gov/Zwm.





Creating and maintaining a positive relationship with landowners will ensure both parties experience the benefits of hunting.



For more information on urban deer hunting, including where to find local ordinances and tips for hunting on private land, visit short.mdc.mo.gov/Zwm.





Check in With the Landowner

You'll also want to walk the property with the landowner so you are certain what's in and what's out of bounds. Knowing the property will help you conceptualize where a shot deer may run, giving you more information for a stand setup that will yield the least amount of interaction with adjacent landowners. It's also wise to ask about the neighbors' attitudes toward hunting. You may find a coalition of residents who will let you hunt a much larger composite tract of land. On the other hand, you may learn that the neighbors on either side aren't too keen on the idea of hunting, so staying away from their property would be best for everyone.

Talk with the landowner about their expectations on communicating your presence. Do they want a text or a call every time you come out? Parking is another consideration. On one property I hunt, the landowner prefers I park at the split in their shared drive with their neighbor. They've already discussed what that means, so both residents know when there's a hunter in the woods. They curtail some of their outdoor activities to give me the best chance at seeing deer.

Never let assumptions degrade the relationship you have. Work out all the details in advance. For example, what are the owner's attitudes toward bringing additional hunters? Do they expect some venison from your harvests? Do they mind if you also shoot turkeys? Being allowed onto someone's land is akin to being asked into their home, even more so on a smaller residential property.

Your default position on field dressing will likely be different than if you were in a larger forest. To avoid drawing unwanted nuisance animals and sulling the fresh autumn air in the neighborhood, assume you'll drag your deer out intact and dress it elsewhere. This is a courtesy not only for the landowner, but for their neighbors, too. They may be considering allowing you to hunt their property, but if your success means a week of unpleasant odors for them, don't count on their permission.

It's not necessary to book an expensive out-of-state hunt just to experience good archery deer hunting. It might literally be right around the corner. If you practice the fundamentals and pay attention to the unique factors required for suburban bowhunting, you might find your freezer stocked up in a big way, all from bowhunting on small property. ▲

Tim Kjellesvik resides in High Ridge and is a hunter, angler, endurance athlete, and outdoor communicator. Find more of his writing, videos, and podcast at TheThinkingWoodsmen.com.



CSI:

CONSERVATION

Missouri conservation agents use
DNA evidence to solve wildlife crimes

by **Gerald Smith and Candice Davis**



Conservation Agent Chris
Horn looks for evidence
on a landowner's property.

**Photograph by
Cliff White**

MANY POPULAR POLICE DRAMAS

begin with a uniformed officer arriving at the scene of a crime. The officer calls in a detective who surveys the scene and calls in a crime scene investigation (CSI) unit. When a crime occurs in nature, no one expects a CSI team to converge on the scene.

These scenes usually begin when a landowner reports hearing a gunshot in the night and finding a wounded deer in the morning. Landowners and poachers are often surprised to learn that local conservation agents are fully equipped to process a crime scene, much like an urban homicide team. Comparable to a homicide detective, the agent will look for footprints, tire tracks, or perhaps a bullet in the carcass. The crime scene is photographed and documented, and the agent interviews neighbors in the hopes of finding a witness. In many

wildlife cases, there are no witnesses, and it's up to the conservation agent to get as much information from the main source of evidence — the animal remains.

Science Can Make the Case

Missouri conservation agents are thankful for advances in DNA technology to help solve wildlife crimes.

"Although the Conservation Department's primary use of DNA technology is for research and management purposes, it can also be used to aid in wildlife law enforcement," said Conservation Agent Paul Veatch of Oregon County.

MDC's Resource Science and Protection divisions entered into an agreement in 2009 with the Center for the Conservation of Biological Resources/WestCore at Black Hills State University in Spearfish, South Dakota, to develop a DNA library for Missouri's elk herd, black bears, furbearer species, and white-tailed deer. The deer library enables researchers to determine what level of variation exists among Missouri white-tailed deer DNA profiles. WestCore used DNA samples from 767 deer across Missouri and sequenced DNA unique to the state's deer at seven specific sites along the DNA molecule. Their findings indicated that, given a population of about 1.3 million deer, the chance of finding two deer with the same DNA "fingerprint" is about 1 in 3 trillion.

This means if a poacher leaves a portion of the carcass of a deer behind — even drops of blood — and puts the venison in the freezer, that meat can be matched to the crime scene using DNA evidence.

Veatch put that technology to work for the first time on a late December night in 2010 on a deer poaching case in Oregon County. A landowner reported hearing a rifle shot near his home and observing the headlights of a pickup truck driving from the direction of the shot. A short time later, he saw what he believed was the same truck returning where the shot had occurred. The vehicle stopped in the roadway, and the headlights were turned off. This prompted the landowner to drive out to where the truck stopped and get the truck's license plate number before it drove off. He then called to report what he had witnessed.

"After making an initial survey of the scene, I interviewed the landowner and laid in wait for over an hour before a car approached the residence," Veatch said. "The car passed the residence, and the driver turned off the headlights, and then stopped at the same location where the landowner had observed the pickup truck."

Conservation Agent Paul Veatch put DNA technology to work in a 2010 deer poaching case.



NOFPADOL PAOTHOONG



When Veatch approached the driver, he learned the person was also the listed owner of the truck reported earlier. The driver denied shooting a deer, there were no firearms in the car, no sign of a deer having been in it, and Veatch saw nothing to indicate there was anyone with the man. However, based on years of law enforcement experience, Veatch suspected the driver knew more than he'd shared.

"I suspected the driver may have let someone out of the vehicle, so I requested backup from the sheriff's office to help secure the area and further investigate," Veatch said.

MDC Regional Supervisor Gerald Smith and Howell County Conservation Agent Matt Franks responded. While Veatch and the driver waited for agents Smith and Franks, another person approached Veatch, emerging from a wooded area. He echoed the driver's denial of any poaching activity.

"The arrival of backup officers can suddenly change a situation," Veatch said.

When sheriff's deputies arrived, Veatch, Smith, and Franks searched the area and found a blood trail near the location of the rifle shot. This led directly to a small button buck, buried in leaves. The agents confronted the men with the new evidence, but they still denied any involvement.

In court, these facts are considered circumstantial evidence. The agents can improve their case with physical evidence that ties the suspect to the crime. So when Veatch noticed small spots of blood on one of the men's boots, he seized them for analysis. The men continued to argue that the blood was from a

**THE CHANCE OF
FINDING TWO DEER
WITH THE SAME
DNA "FINGERPRINT"
IS ABOUT 1 IN 3
TRILLION.**

deer legally taken and checked.

Veatch issued both men court citations for "... illegally possessing or transporting deer or parts thereof" before releasing them from custody. The agents secured samples from the illegally taken button buck and followed strict guidelines for evidence collection to keep from cross-contaminating the samples from the deer and the boots. They submitted the samples to WestCore for DNA analysis,



CONCLUSIONS:

Items #859-01 and #859-02 originated from the same white-tailed deer and resulted in Genotype A. Based on a local database of white-tailed deer DNA the likelihood that another white-tailed deer would randomly result in Genotype A is less than 1 in 3.6 quintillion.



which could provide support for the men's story, or prove that they were responsible for killing the button buck illegally.

Fifty-three days later, WestCore reported that the DNA samples from the boots and the button buck originated from the same animal. They also determined the likelihood of another animal having the same DNA was less than 1 in 3.6 quintillion.

Thanks to these CSI techniques, the case never went to trial. The defendants changed their plea to guilty and the judge fined them \$439.50 each, and \$650 in restitution. In Missouri, money collected from wildlife violation fines issued by conservation agents is donated to schools located in the county.

For Veatch, this is a victory that may never have been won without the use of DNA technology.

Science Can Prove Innocence

Sometimes, though, the victory comes when the same technology proves innocence, such as with a case at the end of the 2016 firearms deer season.

On the last Monday of the year, a Texas County landowner was working on his property just a short distance from a county road when he heard a gunshot. He then saw a pickup truck stopped across from his neighbor's property and a couple of men standing near the tailgate.

"He decided to see what was going on, and as he walked up to the driver's side of the pickup, he saw what he thought was two deer in the back," said Brad Hadley, a Shannon County conservation agent who responded to the call. "He confronted the driver about shooting from a county road, and the driver promptly denied having done so and quickly left the area."

The landowner got the license number of the vehicle as it was

leaving and turned to go back to his property when he noticed his neighbor standing in the county road. He asked his neighbor if he'd heard the shot, and if he knew the driver of vehicle or if anyone had permission to hunt there. The neighbor said he'd heard the shot, but he didn't know the driver or vehicle, and hadn't given anyone permission to hunt. That's when Agent Hadley was called.

"I quickly noted blood-spattered rocks on the county road and bloody drag marks coming off the neighbor's property," Hadley said of his initial investigation.

Hadley collected samples from both locations of blood, retrieved written statements from both the man who made the report and his neighbor, and checked the license plate on the reported pickup truck. The license number gave him a person of interest, so he set out to locate and interview that person.

"He immediately admitted to having been in the area and having a confrontation with the man who called in the incident," Hadley said. "He also denied having killed a deer at the



MDC EVIDENCE PHOTOS

scene, instead saying the deer in the back of his pickup was one he killed that morning, but on his own property a couple of miles away.”

Hadley took samples from the deer and the blood in the back of the man’s pickup, but the witness reports and the man’s own account weren’t matching up. The man insisted on his innocence and gave the conservation agent specific directions to the location where he said he’d killed the deer.

Hadley visited the site where the hunter said he’d taken the deer, but he found no evidence to support the story.

At this point, Hadley had written statements from two witnesses who both heard a gunshot they determined came from the county road. One of those witnesses saw people outside a truck at a location with blood-spattered rocks in the road and bloody drag marks leading to the truck’s location. That witness thought he saw two deer in the back of the pickup, but the second witness statement did not verify the number of deer. The driver of the pickup admitted to having killed a deer that morning and having been at the incident scene with that deer in the back of his pickup, but claimed the deer came from his own property. No physical evidence could be found to support that claim.

Hadley said this is what is commonly referred to as a circumstantial case. All the circumstances of the incident would support allegations of taking a deer from a motor vehicle and roadway and trespassing to retrieve the illegally taken deer. In

any circumstantial case, the officer may use discretion at the time of the incident and not issue citations pending further investigation. This is what Hadley did, choosing to rely on DNA analysis as a forensic tool to help solve the case. In this case, the physical evidence and the DNA in the blood samples collected did not support the circumstantial evidence and the person of interest was cleared.


Science Helps Agents Enforce the Code

These are just two examples of the many routine *Wildlife Code of Missouri* violations conservation agents work to solve daily. Many of these incidents are profoundly similar, yet each has its own, unique circumstances that guide the agent’s decision-making process.

“Not every *Wildlife Code* violation situation warrants sending DNA to a lab, because this type of forensic analysis is relatively expensive,” Hadley said. “But in contested cases or when conservation agents only have circumstantial evidence, DNA analysis may be used to either aid in prosecution or establish innocence.”

Veatch, Hadley, and other Missouri conservation agents continue to use DNA analysis techniques when investigating wildlife violations. CSI Conservation may not be the focus of a high-rated television show anytime soon, but it’s likely currently playing out in real life at a poaching scene in any number of Missouri counties. ▲

Candice Davis is a media specialist for MDC. She enjoys spending quality time with her husband and their two boys exploring conservation areas, hiking, and learning outdoor skills. Gerald Smith is the protection regional district supervisor for the Ozark Region. A native of Oregon County, Gerald still enjoys the many outdoor opportunities that he grew up enjoying in the Ozarks – floating and fishing for smallmouth in the abundant clear Ozark rivers, gigging during the winter months, and deer and turkey hunting.



AGENT HADLEY TOOK SAMPLES FROM THE DEER AND THE BLOOD IN THE BACK OF THE MAN’S PICKUP, BUT THE WITNESS REPORTS AND THE MAN’S OWN ACCOUNT WEREN’T MATCHING UP.

Get Outside

in SEPTEMBER

Fragrant sumac

→ Ways to connect with nature

1 GOING NUTS

Black walnuts, hickory nuts, and pecans are ripe and ready to gather. Find recipes for your bounty at short.mdc.mo.gov/Z3U.



Shagbark hickory nut

2

THE COLORS OF FALL

Fall is upon us, which means the leaves will be turning. Look for fall colors on your favorite trees, including sassafras, sumac, black gum, and dogwood.



Maple leaf

3

KANSAS CITY REGION

Field to Fork: Squirrel and Panfish

Tuesday, Sept. 19 • 6:30–8:30 p.m.

Anita B. Gorman Conservation Discovery Center

4750 Troost Ave., Kansas City, MO 64110

Registration required; call 816-759-7300 by Sept. 14

Bushytails, bass, and bluegill will be on the menu with dishes prepared by Chef Katee McLean of Krokstrom Clubb and Market and Chef Travis Meeks of Kearney Culinary Academy. Learn how to skin a squirrel and fillet a fish to take advantage of some of the most common game in Missouri.



Natural Events to See This Month

Here's what's going on in the natural world.



Sunflowers in bloom



Blue-winged teal migration at its peak



Pawpaw fruits ripen

ST. LOUIS REGION

Firearm Care and Cleaning

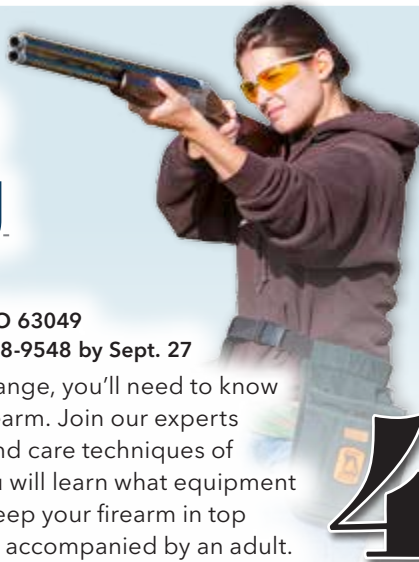
Thursday, Sept. 28 • 6-9 p.m.

Jay Henges Shooting Range

1100 Antire Road, High Ridge, MO 63049

Registration required; call 636-938-9548 by Sept. 27

After the hunt or a day at the range, you'll need to know how to properly clean your firearm. Join our experts as they go over the cleaning and care techniques of different types of firearms. You will learn what equipment and materials are needed to keep your firearm in top condition. Ages 11-15 must be accompanied by an adult.



4



American white pelican

WE HAVE A VISITOR!

Head to your nearest wetland toward the end of the month and through mid-October to catch a glimpse of white pelicans as they migrate through the Show-Me State.



Gem-studded puffball

6

THERE'S A FUNGUS AMONG US

Puffballs and other fall mushrooms are starting to appear. Grab your family and friends and go for a walk in the woods. You're sure to find some native delicacies. But before you dine on your findings, make sure it's edible. For more information, visit short.mdc.mo.gov/Zi6.



Squirrels bury acorns and nuts for winter



Tiger salamanders move to ponds in the rain



ENJOY MORE TIME HERE

Ever have a lost or forgotten permit spoil your outdoor plans? Not anymore. MDC's permits system lets you buy online, print your permit at home, and have it in hand immediately. You can even reprint the permit if you lose or damage it.

Buy your permits online at
mdc.mo.gov/permits



Places to Go

NORTHWEST REGION

J. Thad Ray Memorial Wildlife Area

Outdoor adventures
to write about

by Larry Archer

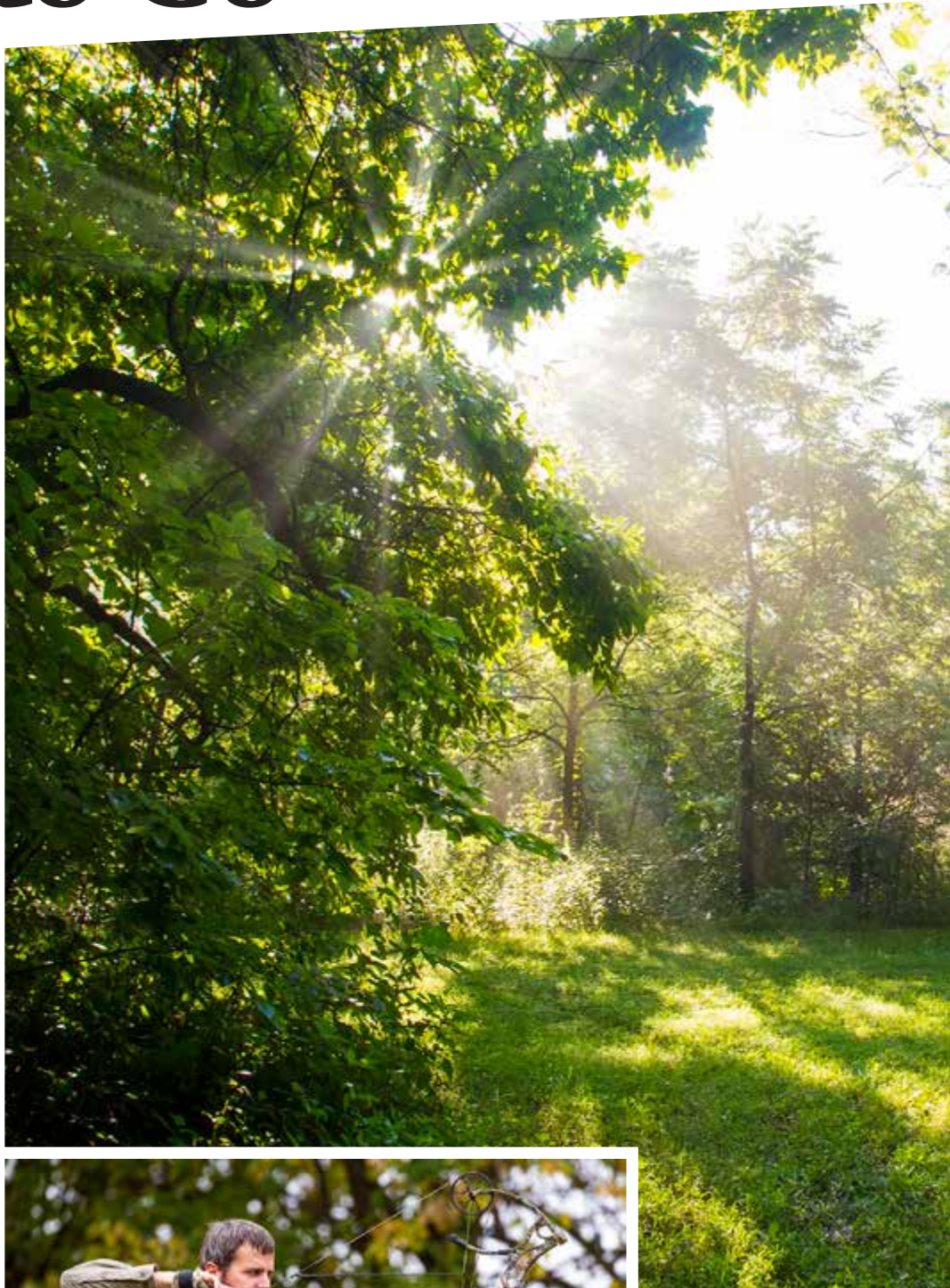
✧ Thanks to author Mark Twain, most people associate the town of Hannibal and adventure with fugitive-hiding caves and rickety rafts floating the waters of the Mississippi River. Hannibal also offers another outdoor adventure — albeit not as harrowing — in the form of J. Thad Ray Memorial Wildlife Area (Ray MWA).

At 178 acres, Ray MWA is relatively small, but its location within the city limits of Hannibal in northeast Missouri makes it a destination for residents who want to enjoy nature, said Kyle Monroe, area manager.

“It’s about a 50-50 mix of woods and open land, and we manage the land for small game and pollinators, so we do prescribed burning,” Monroe said. “The two main users are joggers and walkers, who use the mowed paths on the area, and archers.”

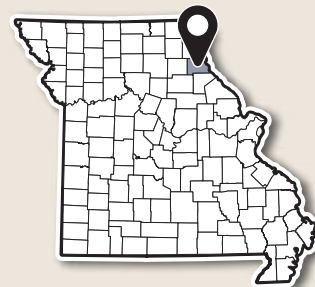
When they arrive this fall to begin practice for deer season, archers will find the area’s range updated with new targets, including ones designed for crossbows, which are now an approved method for harvesting deer during archery season.

Donated to the state in 1971, Ray MWA wasn’t public land in Twain’s time, but it is available now for adventure for a new generation of Toms, Beckys, and Hucks.



An updated archery range at the area helps hunters prepare for deer season. Some new targets are designed for crossbows, which are now an approved method for harvesting deer during archery season.

NOPPADOL PAOTHONG







J. THAD RAY MEMORIAL WILDLIFE AREA

is located within the city limits of Hannibal. From the junction of Route W and U.S. Highway 61, take Route W west approximately 1 mile.

N39° 43' 44.75" | W91° 24' 45.25"

short.mdc.mo.gov/Zi9 573-248-2530

WHAT TO DO WHEN YOU VISIT

-  **Archery Range** Includes a walking range with 10 targets and a static range with five targets. Open sunrise to sunset year-round.
-  **Hiking** Mowed paths available for hiking.
-  **Hunting** Deer (Good) and turkey (Fair). Deer and turkey regulations are subject to annual changes, so refer to the *Spring Turkey* and *Fall Deer and Turkey* booklets for current regulations.
-  **Nature Viewing** Open land consists of native warm-season grasses and wildflowers, which provide habitat for a variety of wildlife.

"I am a runner and biker, so I love jogging around the trails and seeing the rabbits running around and the wildflowers that are coming in from our prescribed burn efforts."

—Area Manager Kyle Monroe

WHAT TO LOOK FOR WHEN YOU VISIT



Butterfly weed



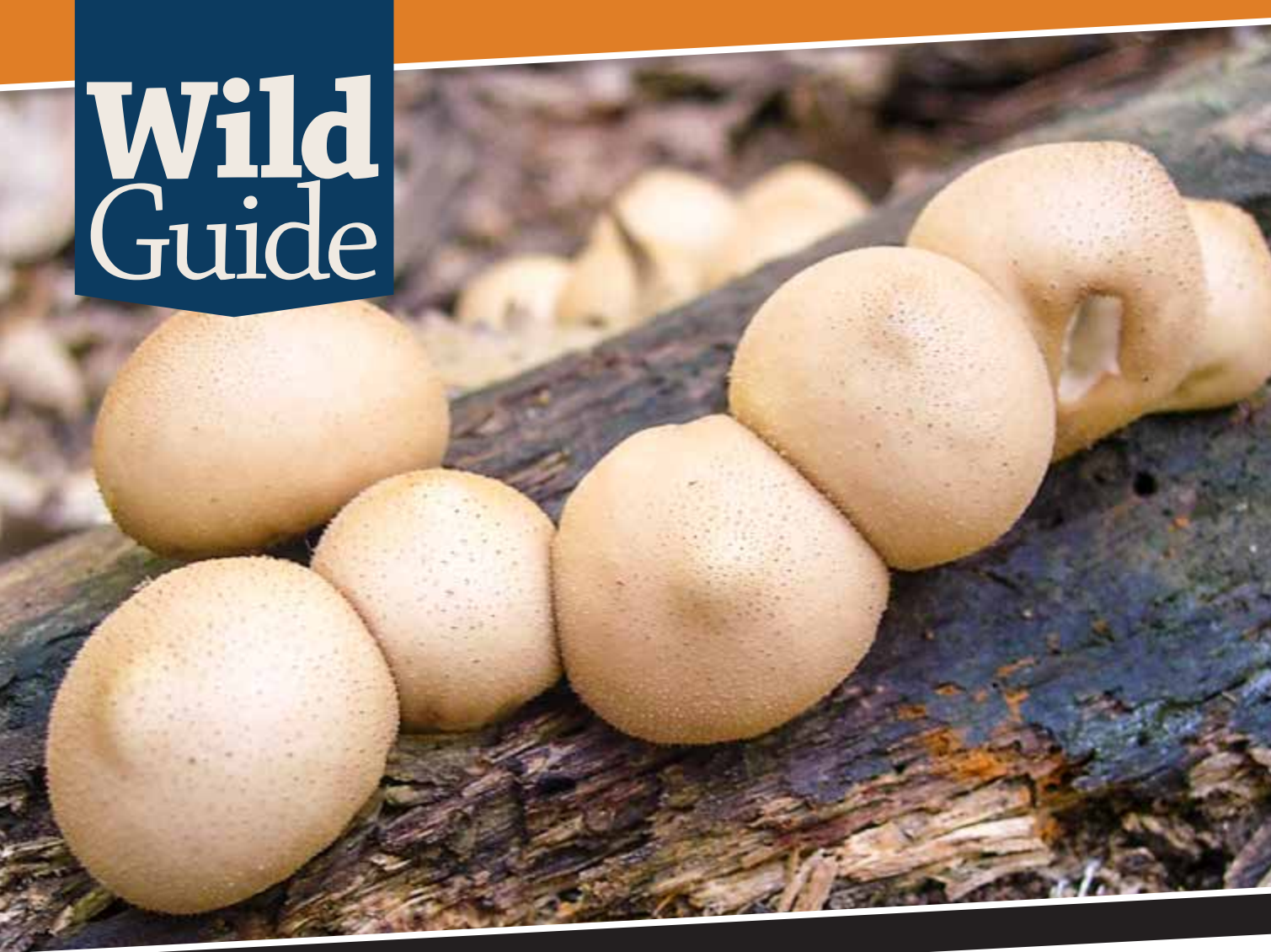
Eastern meadowlark



Raccoon



Western ratsnake



Pear-Shaped Puffball

Lycoperdon pyriforme

Status

Excellent edible mushroom when young and fresh. Cut open each puffball from top to bottom to confirm your identification. When eating a wild mushroom for the first time, it's a good idea to sample a small amount first, since some people are allergic to certain fungi.

Size

$\frac{1}{2}$ – $1\frac{1}{2}$ inches wide,
 $\frac{1}{2}$ – $1\frac{3}{4}$ inches tall

Distribution

Statewide



Did You Know?

The pear-shaped puffball's genus name, *Lycoperdon*, literally translates to "wolf fart," from the Greek "lyco" meaning "wolf" and "perdon" meaning "break wind."

Have your mushroom and eat it, too, when you find a pear-shaped puffball. This small, round mushroom grows in clusters on decaying wood. They are pure white on the inside and yellow to brown on the outside with tiny warts on the surface. Puffballs are edible while young and fresh. Peel off the outer skin, then batter and fry them, or sauté them in olive oil for a mycological treat.

—ELEANOR C. HASENBECK



LIFE CYCLE

Puffballs spend most of the year as a network of fungal cells called *mycelium*, which penetrate into dead wood, digesting and decaying it. When ready to reproduce, the puffball develops above ground. The fruiting body of a puffball contains a spore sac. When young, the spore sac is solid inside, but as it matures it becomes a mass of powdery spores. The spores puff out from a pore that forms at the top of the sac.



ECOSYSTEM CONNECTIONS

Puffballs are one of the many fungi species that live on decaying wood. Decomposers like puffballs play an important role in breaking down wood and returning nutrients to the soil.

Outdoor Calendar

❖ MISSOURI DEPARTMENT OF CONSERVATION ❖

FISHING

Black Bass

Impounded waters and most streams north of the Missouri River:
Open all year

Most streams south of the Missouri River:
May 27, 2017–Feb. 28, 2018

Bullfrogs, Green Frogs

June 30 at sunset–Oct. 31, 2017

Nongame Fish Giggling

Impounded Waters, sunrise to sunset:
Feb. 1–Sept. 14, 2017

Streams and Impounded Waters,
sunrise to midnight:
Sept. 15, 2017–Jan. 31, 2018

Paddlefish

On the Mississippi River:
Sept. 15–Dec. 15, 2017

Trout Parks

Catch-and-Keep:
March 1–Oct. 31, 2017

Catch-and-Release:
Nov. 10, 2017–Feb. 12, 2018



Dove season opens Sept. 1, followed closely by deer and turkey archery seasons on Sept. 15. Get the latest on limits, methods, and other regulations with the *2017 Migratory Bird Hunting Digest* and the *2017 Fall Deer and Turkey* booklet. Both publications are available at MDC regional offices and online at short.mdc.mo.gov/ZZf.



Free MO Hunting and MO Fishing Apps

MO Hunting makes it easy to buy permits, electronically notch them, and Telecheck your harvest. MO Fishing lets you buy permits, find great places to fish, and ID your catch. Get both in Android or iPhone platforms at short.mdc.mo.gov/Zi2.



HUNTING

Bullfrogs, Green Frogs

June 30 at sunset–Oct. 31, 2017

Coyote

Restrictions apply during April, spring turkey season, and firearms deer season.

Open all year

Crow

Nov. 1, 2017–March 3, 2018

Deer

Archery:
Sept. 15–Nov. 10, 2017
Nov. 22, 2017–Jan. 15, 2018

Firearms:

- ▶ Early youth portion (ages 6–15):
Oct. 28–29, 2017
- ▶ November portion:
Nov. 11–21, 2017
- ▶ Late Youth Portion (ages 6–15):
Nov. 24–26, 2017
- ▶ Antlerless Portion (open areas only):
Dec. 1–3, 2017
- ▶ Alternative Methods Portion:
Dec. 23, 2017–Jan. 2, 2018

Dove

Sept. 1–Nov. 29, 2017

Groundhog (woodchuck)

May 8–Dec. 15, 2017

Pheasant

Youth (ages 6–15):
Oct. 28–Oct. 29, 2017

Regular:
Nov. 1, 2017–Jan. 15, 2018

Quail

Youth (ages 6–15):
Oct. 28–Oct. 29, 2017

Regular:
Nov. 1, 2017–Jan. 15, 2018



Rabbit

Oct. 1, 2017–Feb. 15, 2018

Sora, Virginia Rails

Sept. 1–Nov. 9, 2017

Squirrel

May 27, 2017–Feb. 15, 2018

Teal

Sept. 9–24, 2017

Turkey

Archery:
Sept. 15–Nov. 10, 2017
Nov. 22, 2017–Jan. 15, 2018

Firearms:
▶ Fall: Oct. 1–31, 2017

Waterfowl

See the *Waterfowl Hunting Digest* or visit short.mdc.mo.gov/ZZx for more information.

Wilson's (Common) Snipe

Sept. 1–Dec. 16, 2017

Woodcock

Oct. 15–Nov. 28, 2017

For complete information about seasons, limits, methods, and restrictions, consult the *Wildlife Code of Missouri* at short.mdc.mo.gov/Zib. Current hunting, trapping, and fishing regulation booklets are available online at short.mdc.mo.gov/ZZf or from local permit vendors.



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This little blue heron found a fishing spot in the swampy areas of Forest Park, located on the western side of St. Louis. Where will you find your next fishing spot? For a list of fishing holes near you, visit short.mdc.mo.gov/Ziy.

by **David Stonner**